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Craig

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[54] **APPARATUS FOR ATTACHING INSULATING MATERIAL TO SHEET METAL**

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[52] **U.S. Cl.** **227/100**

[51] **Int. Cl.**[2] **B27F 7/02**

[58] **Field of Search** 227/2, 3, 39, 40, 41, 42, 227/43, 44, 81, 99, 100, 101, 103, 153, 154

[56] **References Cited**

UNITED STATES PATENTS

1,019,118	3/1912	Ashton	227/154 X
1,886,971	11/1932	Newhouse	227/81
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2,733,439	2/1956	Pikal	227/2
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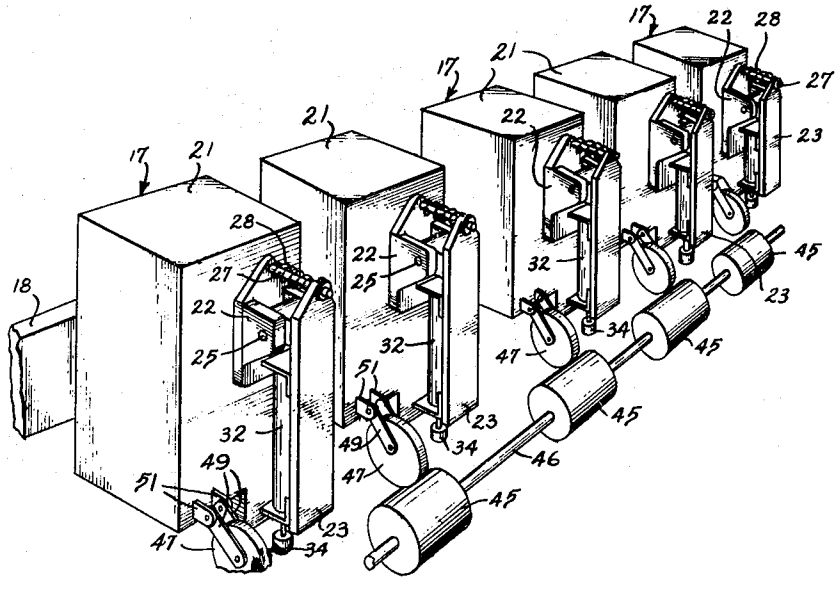
[57] **ABSTRACT**

Apparatus mounted on a fixed structure and including a plurality of selectively operable fastener applying guns for securing insulating material to sheet metal without the fastener passing through the sheet metal and while the insulating material and the sheet metal are moving continuously. The apparatus includes a plurality of guns mounted on swinging members and located above a rotating anvil and adjacent to a hold-down roller so that the guns can swing while the fasteners are penetrating the work and move with the work during the time the fasteners are being driven.

7 Claims, 4 Drawing Figures



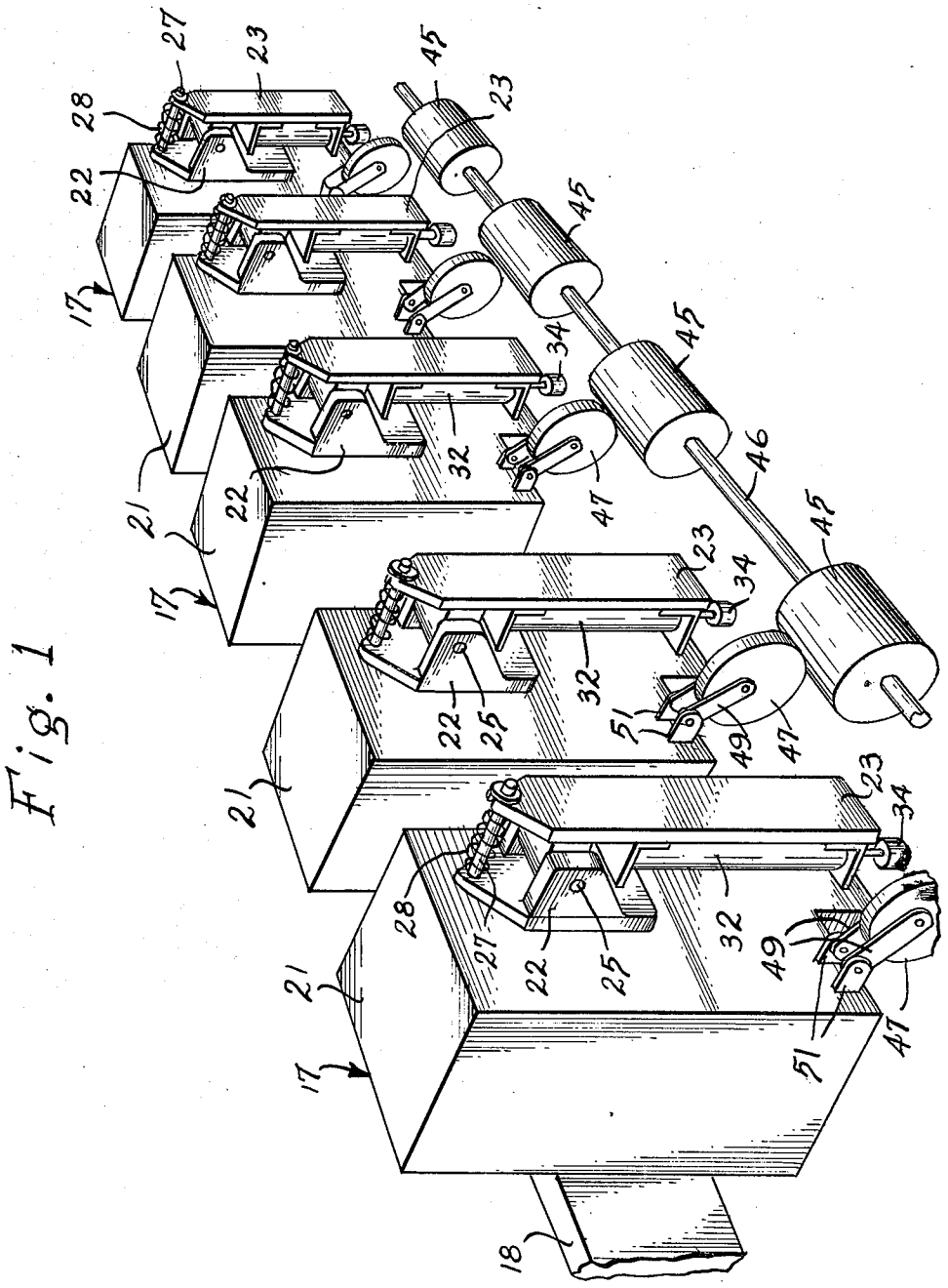


Fig. 1

Fig. 2

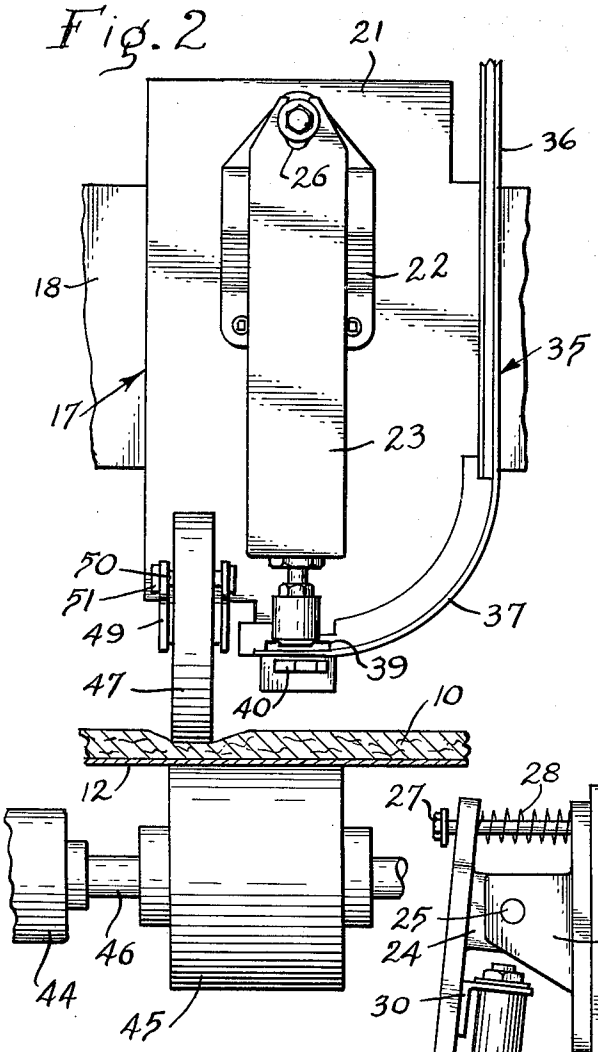


Fig. 3

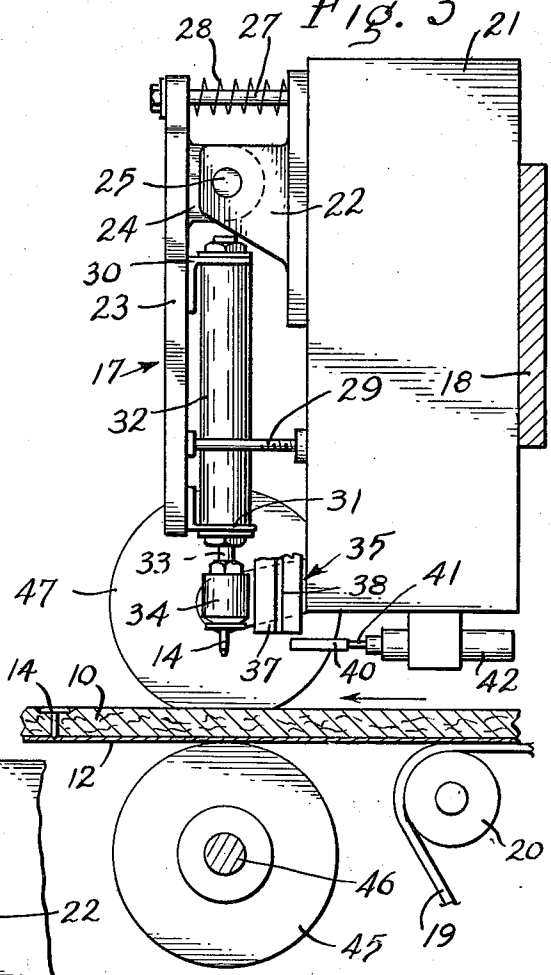
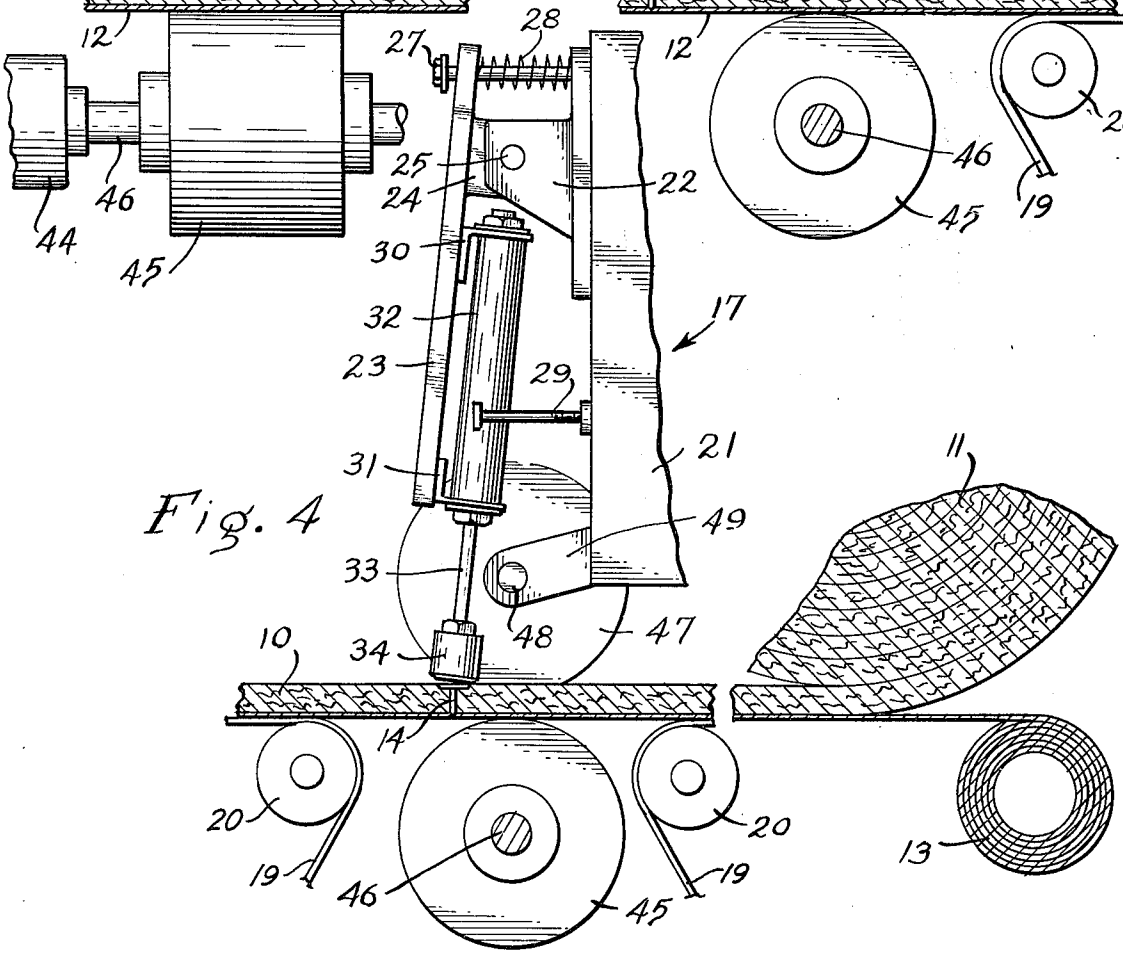


Fig. 4



APPARATUS FOR ATTACHING INSULATING MATERIAL TO SHEET METAL

BACKGROUND OF THE INVENTION

1. Field of the Invention.

This invention relates generally to fasteners of various kinds and relates particularly to fastener applying machines which are swingably mounted on a fixed structure and drive fasteners into a continuously moving workpiece.

2. Description of the Prior Art.

Heretofore many fastener applying machines have been provided for automatically driving a fastener into a workpiece; however, most of these prior art devices were either portable so that the tool was moved to a desired location on the workpiece and then activated, or the work was brought to the tool and the tool was activated while the workpiece was located in fixed position.

Some efforts have been made to provide fastener applying machines capable of driving a fastener into a workpiece while one of the elements was moving relative to the other. Some examples of the prior art are U.S. Pat. Nos. 1,999,821 to Newhouse; 3,576,286 to Bunch; 3,666,155 to Saluzzi; and 3,774,833 to Deshich.

SUMMARY OF THE INVENTION

The present invention is a fastener applying machine having a plurality of guns which are swingably mounted on a fixed frame and each of such guns is associated with a rotary anvil and a hold-down roller. Such fastener applying machine is capable of driving one or more fasteners through a layer of insulating material and into sheet metal while the insulating material and the sheet metal are continuously moving and without causing the fastener to penetrate entirely through the sheet metal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective illustrating one application of the fastener applying machine of the present invention.

FIG. 2 is a front elevation of one of the nailing guns.

FIG. 3 is a side elevation thereof.

FIG. 4 is a side elevation illustrating the relationship of the parts while the fastener is being driven.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With continued reference to the drawings, a layer of insulating material **10** which is usually stored in a coil **11** of indefinite length is to be secured to a strip of sheet metal **12** which normally is wound into a coil **13.** In order to mount the insulating material **10** on the sheet metal **12** without penetrating entirely through the sheet metal, a fastener **14,** such as shown in U.S. Pat. No. 3,095,777 to Hallock, is driven through the insulating material and into the sheet metal in such a manner that the penetrating end of the fastener does not pass entirely through the sheet metal but instead is deformed slightly to clinch a globule of metal and prevent easy withdrawal of the fastener.

In order to drive one or more fasteners **14,** a plurality of fastener applying guns or machines **17** are mounted on the upper support **18** of a frame and such frame includes a conventional bed such as a belt type conveyor **19** carried by rollers **20** which supports the strip of sheet metal **12** and the insulating material **10.** Each of the fastener applying machines **17** includes a housing **21** having a yoke **22** fixed to the side opposite the upper support **18.** A support member **23** is provided with a lug **24** intermediate the ends thereof and such lug is swingably connected by a pivot pin **25** to the yoke **22.** Normally the member **23** is located in a generally vertical position and the upper end of such member has a slot **26** through which a stud **27** carried by the housing **21** extends. A compression spring **28** is located about the stud **27** and urges the upper end of the support member **23** outwardly. An adjustable stop **29** is mounted on the housing **21** and extends outwardly to a position to engage and stop the lower end of the member **23** so that the spring **28** normally urges the lower end of the support member **23** against the stop **29.**

A pair of upper and lower brackets **30** and **31** are mounted on the member **23** and such upper and lower brackets support a generally vertically disposed fluid cylinder **32.** The cylinder **32** has a piston rod **33** extending downwardly therefrom and the lower end of such piston rod is connected to a magnetic driving head **34.**

In order to supply fasteners **14** to the driving head **34,** a chute **35** is connected to the housing **21** and such chute includes a generally vertical upper portion **36** and an arcuate lower portion **37.** The upper portion **36** preferably is connected to a supply of fasteners (not shown) which feeds fasteners continuously into the chute **35** in such a manner that the heads of the fasteners are retained in the chute while the shanks extend outwardly through a slot **38.** The arcuate lower portion **37** of the chute terminates adjacent to the driving head **34** and such lower portion is provided with an opening **39** substantially in alignment with the lower end of the magnetic head. A transfer block **40** having a V-shaped notch in its outer end is mounted on the piston rod **41** of a fluid cylinder **42** which is mounted on the bottom of the housing **21.** When the fluid cylinder is operated in one direction, the piston rod **41** is extended to cause the transfer block **40** to engage the lowermost fastener in the chute **35** and move such fastener out of the chute through the opening **39** to a position immediately below the driving head **34.** In this position the magnetic driving head attracts the fastener **14** and holds such fastener in position on the bottom of the driving head after which the transfer block **40** is retracted.

A rotatable anvil **45** is mounted on a shaft **46** with a portion of the anvil being located directly below the driving head **34** and such shaft is driven in any desired manner by a power plant **44.** The anvil **45** directly supports the strip of sheet metal **12** and the insulating material **10** and in order for the anvil to provide the driving force for moving the sheet metal and the insulating material through the machine, a hold-down roller **47** is located above a portion of the anvil and is rotatably mounted by a pivot **48** to an arm **49.** The opposite end of such arm is swingably mounted by a pivot **50** to lugs **51** carried by the housing **21.** The hold-down roller may be relatively heavy so that it holds the insulating material **10** against the sheet metal **12** by gravity, or if desired a spring (not shown) or other resilient member may be provided on the arm **49** for urging the hold-down roller **47** downwardly.

In the operation of the device, the strip of sheet metal **12** and the insulating material **10** are placed between the anvil **45** and the hold-down roller **47** with the insu-

lation material overlying the sheet metal. As the shaft **46** is being driven, the anvil **45** continuously moves the sheet metal and the insulating material along the bed **20.** At selected intervals the fluid cylinder **32** is energized to drive the head **34** with the fastener **14** thereon downwardly to cause the fastener to penetrate through the insulating material **10** and engage the sheet metal **12.** Since the anvil **45** is rotating, little or no pitting occurs on the anvil since the spot below the nail is constantly being changed. Due to the fact that the sheet metal is in intimate engagement with the anvil, a solid base is provided even though the anvil is rotating at the time and accordingly little or no bounce or denting of the sheet metal occurs.

As the fastener **14** begins to penetrate the insulating material on the downward stroke of the piston rod **33,** the forward movement of the insulating material and the sheet metal causes the support member **23** to begin to swing outwardly at the bottom so that the fastener remains in substantially fixed position relative to the insulating material and the sheet metal. Outward movement of the bottom of the support member **23** causes such member to move away from the stop **29** and simultaneously compress the spring **28** at the upper end of such member. When the fastener has been driven through the insulating material and is attached to the sheet metal, the forward movement of the material breaks the magnetic contact between the driving head **34** and the fastener **14** at which time the outward force of the spring **28** causes the support member **23** to return to a vertical position against the stop **29.** Simultaneously the piston rod **33** is retracted into the fluid cylinder **32** and after the support member engages the stop **29,** the fluid cylinder **42** is energized to cause the transfer block to be advanced and transfer another fastener from the chute **35** to the lower end of the magnetic driving head **34** and the operation is repeated.

I claim:

1. Apparatus for mounting insulating material onto sheet metal by means of clinch-type fasteners comprising a frame, at least one fastener applying machine mounted on said frame, said fastener applying machine including a housing, a support member swingably mounted on said housing, fluid cylinder means mounted on said support member and having a downwardly extending piston rod, a magnetic driving head fixed to the lower end of said piston rod, fastener chute means having a portion located adjacent to said driving head, means for transferring a fastener from said chute means to said driving head, a rotatable anvil mounted below said driving head, a hold-down roller located adjacent to said driving head and above said anvil, and means for driving said rotatable anvil, whereby a strip of sheet metal and an overlying strip of insulating material located between said anvil and said roller are driven in a direction normal to said fluid cylinder so that when said cylinder is energized a fastener carried by said magnetic head is caused to penetrate the insulating material and grippingly engage the sheet metal and penetration of said insulating material by said fastener causes said fluid cylinder to swing so that no relative motion between the fastener and the material occurs during the driving process.

2. The structure of claim **1** including resilient means for returning said support member to its initial position.

3. The structure of claim **1** in which a plurality of fastener applying machines are mounted on said frame.

4. In an apparatus for driving fasteners into work and including at least one fastener applying machine, means for supplying fasteners to said fastener applying machine, and said work being continuously moved generally normal to said fastener applying machine, the improvement comprising a rotatable anvil having a portion located directly below said fastener applying machine, means for driving said anvil to cause said work to be advanced, a hold-down roller mounted adjacent to said fastener applying machine and directly over another portion of said anvil, and said fastener applying machine being mounted in a manner such that said fastener applying machine is swung during penetration of the fastener so that no relative movement occurs between the fastener and the work while the fastener is being driven.

5. Apparatus for mounting insulating material onto sheet metal comprising a frame, at least one fastener applying means mounted on said frame, said fastener applying means including a housing, a support member swingably mounted on said housing, a fluid cylinder carried by said support member and having a downwardly extending piston rod, a driving head fixed to the lower end of said piston rod, a plurality of fasteners disposed within fastener chute means having a portion located adjacent to said driving head, means for transferring a fastener from said chute means to said driving head, each of said fasteners being connectable to the sheet metal without penetrating entirely therethrough, an anvil mounted below said driving head, and means for continuously moving said insulating material and said sheet metal through said apparatus between said driving head and said anvil in a direction generally normal to said fluid cylinder, whereby when said fluid cylinder is operated, a fastener carried by said driving head penetrates the insulating material and into engagement with the sheet metal and penetration of the insulating material by the fastener causes said fluid cylinder to swing so that no relative motion occurs between the fastener and the material during the driving process.

6. In an apparatus for driving fasteners through a layer of insulating material and attaching the fasteners to a sheet metal substrate and in which the apparatus includes at least one fastener applying means located along an axis, means for supplying fasteners to the fastener applying means, and an anvil having a portion located generally along the axis of the fastener applying means and being spaced therefrom, the improvement comprising means for swingably mounting said fastener applying means on a frame, means for continuously moving the insulating material and the sheet metal through the apparatus in a direction generally normal to the axis of the fastener applying means, means for intermittently operating the fastener applying means to cause a fastener to penetrate through the insulating material into engagement with the sheet metal substrate, and at least portions of said fastener applying means being moved with the insulating material and the substrate during the penetration and attaching of said fastener, whereby no relative movement occurs between the fastener and the sheet metal while the fastener is penetrating the insulating material and is being attached to the substrate.

7. In an apparatus for driving fasteners into work and including at least one fastener applying machine, and means for supplying fasteners to said fastener applying machine, the improvement comprising a rotatable anvil

having a portion located directly below said fastener applying machine, means for causing said work to be continuously advanced generally normal to said fastener applying machine, a hold-down roller mounted adjacent to said fastener applying machine and directly over another portion of said anvil, and said fastener applying machine being mounted in a manner such that said fastener applying machine is swung during the driving of the fastener so that no relative movement occurs between the fastener and the work while the fastener is being driven.

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